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Death rates from diabetes mellitus in Ireland 1833 – 1983: a historical commentary

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SUMMARY

A world-wide increase in diabetic deaths and a varying rate of increase between one country and another over the past hundred years has long been recognised. During the nineteenth century, the incidence of diabetes was low in Ireland as measured by mortality. Nevertheless, the rising trend found elsewhere was also apparent in Ireland. Recorded deaths were 0.22/100,000 of the population in 1840, rising to 13.2 by 1972. Most of the increase occurred between the 1880s and 1911, but only 15% of this can be accounted for by an ageing population. It is, therefore, necessary to seek other explanations. During the period, sugar and fat consumption in Ireland rose sharply. It has not been possible precisely to relate dietary causes to the incidence of diabetes, but the Irish experience suggests that such a link may exist.

INTRODUCTION

Sir William Wilde in his report on deaths written for the 1841 census of Ireland stated that the prominent diabetic symptoms of increased thirst and appetite and raised output of urine were frequently mentioned in the early Irish manuscripts. Of course, it is debatable whether these symptoms really were the consequence of diabetes mellitus or of some other disorder. Nevertheless, legend provides some colourful metaphors for the disease.

> *'Aire Luachra'*, the lizard of the rushes, . . . (and it) is believed by country people to enter the throats of persons who may happen to fall asleep in the open air, and taking its abode in the stomach, it there generates by its inordinate craving for food, . . . [1]

An historical study of the occurrence of diabetes is not possible before the nineteenth century and even then is plagued with difficulties since the data consist exclusively of mortality statistics. Such material is unreliable, particularly in the case of diabetes mellitus, as often the disease was not the proximate cause of death, and there is evidence to suggest that for some time in such cases diabetes was not recorded on the death certificate. Problems may also arise out of differences in definitions of diabetes. Yet mortality statistics are all we have, and they do indicate a trend. Both Joslin et al[2, 3] and Himsworth[4] used figures of diabetic deaths in their retrospective studies.

SOURCES

For Ireland the statistics extend back to the 1830s. These are found in two sources: the decennial Irish censuses, and the Annual reports of the

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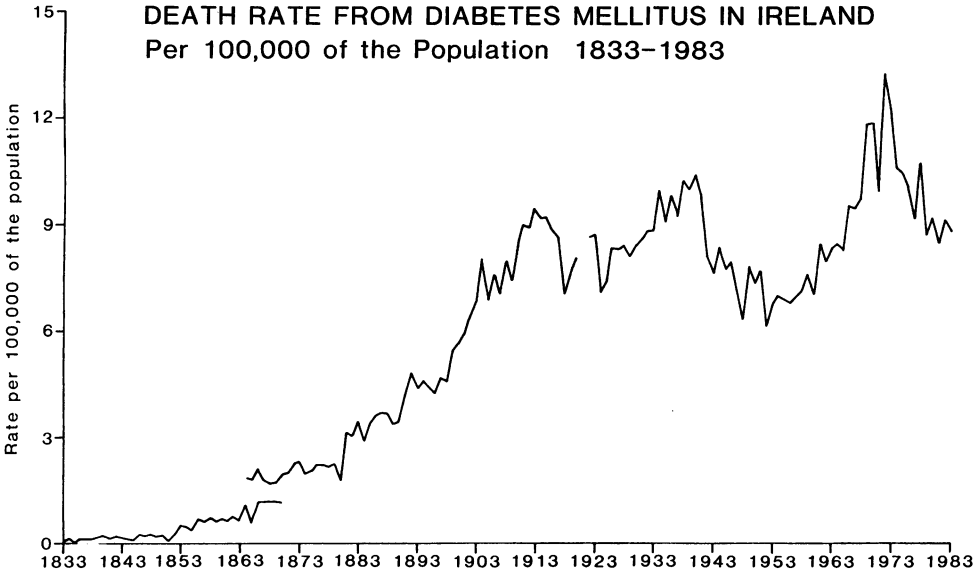
Registrar-General for Ireland. Four Irish censuses, 1841, 1851, 1861 and 1871 publish tables recording deaths from certain diseases including diabetes mellitus. (From 1881 the Census of Ireland no longer recorded number and causes of death). Since each census contained retrospective data for the preceding ten years we possess figures of diabetic deaths from 1831/2 to 1870. (In the 1841 Census of Ireland the years 1831 and 1832 were aggregated, and so they have been eliminated from the survey). From 1864 the Registrar-General was charged by statute with the responsibility for collecting mortality statistics, including causes of death, and these continue to the present day.[5] The Figure plots the death rates from diabetes mellitus in Ireland from 1833 to 1983 compiled from these two sources.

FIGURE



Before analysing the trends it is important to discuss the different ways by which these statistics were obtained. The census figures were extracted from the household returns, which were filled in by the head of the household or on his behalf. The Registrar-General's data, on the other hand, were compiled from death certificates, which had to be filled in by a medically qualified person. The different methods of acquiring the information probably explain the disparity during those years of overlap, 1864 – 1870. After 1871 the censuses no longer carried detailed information on causes of death.

TRENDS

Very low, though steadily increasing, numbers of diabetic deaths were recorded in Ireland between 1833 and 1880. Several dips in the trend are noteworthy. The drop in 1851 was probably a recording quirk in the aftermath of the Famine, and the fall in 1880 can be explained by a subsistence crisis during 1879/80 when deaths from other causes could have swamped diabetes mellitus. Between 1880 and 1881 the recorded death rate from diabetes rose sharply from 1.8 to 3.2/100,000, an increase which coincided with a change in disease classification in the Registrar-General's reports. From 1881 the diabetic death rate climbed

erratically to 9.5 in 1913. Over the next 28 years, the rising trend was interrupted at three points. The drop in 1918/19 probably reflects the influence of food shortages in the closing years of the First World War. The trough in the 1940s is for the same reason. The decline in 1924/25 is more difficult to explain. A fall also occurred in America at this time, insulin injection therapy being the cause. Whether this explanation will serve for Ireland cannot be stated with accuracy since we do not have a definite date for the first administration of insulin. But the most obvious feature of the inter-war years is the long-term stability of the diabetic death rate. The rate fell during the years of the war and post-war shortages before rising again in the late 1950s, reaching a new peak of 13.2/100,000 in 1972. Thereafter the trend has been downward with a number of small peaks in isolated years. The gap in the graph for 1921 is because no records were collected for the partition year.

The rise in the diabetic death rate between the 1860s and 1930s parallels a world-wide increase. While we do not have international statistics stretching back to the mid-nineteenth century, data from 1900 demonstrate the point (Table I).[2,4] A comparison of mortality from diabetes in Ireland with other countries shows that its position was at the bottom of the international league table. Furthermore, the pace of increase in Ireland was slow.

Diabetes is more prevalent among the elderly, and so an important factor which must be considered in our assessment of the Irish incidence is the changing age structure of the population which was ageing, principally because of emigration. In order to eliminate the effect of ageing, the rates have been standardised, using the 1861 age structure as the base. This adjustment, shown in Table II, revealed that by 1911 only 15% of the increase in deaths from diabetes mellitus can be explained by the changing age structure, leaving 85% to be explained in some other way.

TABLE I

Diabetic death rates in principal countries 1900 – 1930 (per 100,000)

	1900	*1905*	*1910*	*1915*	*1920*	*1925*	*1930*
United States	11.0	13.9	17.6	21.5	20.4	21.0	24.0
England and Wales	8.6	9.3	11.0	13.0*	10.0*	11.2	14.2
Netherlands	—	—	9.9	13.1	12.6	14.5	17.6
Italy	3.3	4.0	4.7	5.3	4.5	5.9	8.2
Australia	—	—	9.5	10.4*	11.5*	11.4	11.2
Japan	—	—	1.8	2.9	3.1	3.3	3.5
New Zealand	7.5	—	12.4	13.5	12.5	12.2	15.7
Scotland	7.2	—	9.7	11.4	9.0	9.4	12.5
Switzerland	5.6	—	—	7.6	7.7	9.2	11.0
Ireland	6.0	7.0	8.7	9.3	8.4	7.7	8.4
N. Ireland**	—	—	—	10.6	9.5	8.3	9.7
Irish Free State	—	—	—	8.9	7.6	7.4	8.0

Extracted from Joslin EP, Dublin LI, Marks HH, *Studies in diabetes mellitus* (Ref.2). p.761; Annual reports of the Registrar-General for Ireland, 1900 – 20; Annual reports of the Registrar-General for Northern Ireland, 1925 and 1930.

*Death rates based on civilian population.

**Antrim, Armagh, Down, Fermanagh, Londonderry and Tyrone, which became Northern Ireland after 1920.

TABLE II

Crude and age standardised diabetic death rates

	A. *Crude death rate*	*B.* *Age-adjusted death rate*	*Percentage A/B*
1864–8	1.9	1.9	100%
1869–73	2.1	2.0	95%
1881–3	3.2	3.1	97%
1889–93	4.2	3.9	93%
1899–1903	6.2	5.7	91%
1909–13	8.7	7.4	85%

ANALYSIS

Diet plays a major role in the treatment of diabetes mellitus,[6] but is it also a cause of the disease? Different dietary customs are found in different countries and, within countries, social classes have different food consumption patterns. Over the past half century dietary surveys have been carried out in many countries and some have been examined in an attempt to explain the diabeticity of particular nations and races. As a result a number of dietary theories have been advanced to account for the differing incidence of diabetes.[4,7–10] One has focused attention on the fat content of the diet: the higher the level of fat the higher the incidence of diabetes.[4] Another has explored the relationship between the type of carbohydrate and diabetes, with the conclusion that increased incidence in diabetes has been the consequence of rising sugar consumption.[7] Still other research has questioned these hypotheses, and pointed instead to an excess of energy value over expenditure, causing obesity, which then predisposes towards diabetes.[10]

Can we explain the low rate of diabetic deaths in Ireland by dietary characteristics? Further, can the rising death rate from diabetes be attributed to changes in the Irish dietary pattern? Nutritional analysis of Irish diets is possible because of the existence of seven dietary surveys of labouring-class families, taken at intervals over a sixty-year period, 1839–1904.[11–17] Since labourers constituted a large section of the country's population and their dietary pattern mirrored on a reduced scale that of the rest of the population, these surveys provide us with a measure of the diet generally pertaining. Discussion will be restricted to the period before the First World War for it was then that the greatest increase in diabetic death rates occurred, and it was also when the most dramatic change in Irish dietary patterns took place.

Before the Great Famine, the Irish labouring classes subsisted on huge quantities of potatoes, washed down with skimmed milk, buttermilk or sometimes whole milk. Such a diet is very high in carbohydrate and exceptionally low in fat, particularly when skimmed milk or buttermilk were drunk. The Great Famine marked a distinct break with this monotonous régime, particularly for those living in the east and south-west. Greater culinary variety was established by the 1850s. Table III illustrates this increase in variety of fare by presenting typical dietary histories from two dietary surveys, one taken in 1839, the other 1863.

TABLE III

Weekly food rations of Irish labourers (Co. Tipperary) 1839 & 1863

1839 *(Per labouring man)*	*1863* *(For a seven-person family)*
63 lb. — 94½ lb. Potatoes	7 lb. Flour
21 pt. — 42 pt. Skimmed milk	56 lb. Indian meal
	140 lb. Potatoes
	1½ lb. Sugar
	2 lb. Butter
	2 lb. Meat
	56 pt. Skimmed milk
	14 Eggs

Source: *Sixth annual report of the Poor Law Commissioners, BPP1840 (245) XVII, Appendix D: 244, Sixth report of the Medical Officer of the Privy Council, BPP 1864 (3416) XXVIII: 324.*

In nutritional composition these two diets were very different. Turning to the country as a whole, Table IV provides a clear picture of the changing pattern in nutrient content which occurred in the diet of the Irish labourers between 1839 and 1904. The 1839 diet had a very high percentage of energy value (87%) derived from carbohydrate, all of which was starch, while the percentage of energy contributed by fat was exceptionally low at a mere 1%. Such a nutritional pattern closely resembles that of the Japanese,[4] and in both Ireland and Japan, when this configuration was present, the mortality rate from diabetes mellitus was low. By 1859 the energy value contribution of carbohydrate had fallen to 77%, whereas the fat contribution had increased tenfold. This trend continued so that by the opening years of the twentieth century the carbohydrate contribution had contracted even further to 66%, while the percentage of energy value obtained from fat had jumped to 24%. Ireland was then following a pattern evident elsewhere, with diabetes increasing.

TABLE IV

Nutritional analysis of the Irish labourers' diet 1839 – 1904

		Protein		*Fat*		*Carbohydrate*		*Energy value*
	No	*g.*	*% of Kcal*	*g.*	*% of Kcal*	*g.*	*% of Kcal*	*Kcal*
1839 Survey*	13	135	12	4	1	1099	87	4720
1859 Survey	161	105	12	40	10	760	77	3682
1863 Survey	52	111	11	40	9	843	79	4008
1904 Survey	190	82	10	87	24	590	66	3370

*Dietary analysis is based on a menu of potatoes and skimmed milk. When whole milk is substituted for skimmed milk the contribution of fat to energy value rises to only 5%.

Another important dietary change to occur from the closing decades of the nineteenth century was the increase in consumption of sugar among the labouring classes. The evidence comes from two sources. The dietary surveys reveal that daily adult consumption rose tenfold between 1859 and 1904. Imports of sugar into Ireland tell the same story. Published figures for trade into the principal Irish ports indicate an almost eightfold increase in sugar imports between 1889 and 1914 (See Table V).[18] If the suggested connection between rising sugar consumption and the rising incidence of diabetes is correct, then the growing wealth of nineteenth century Ireland brought to its people a disease of affluence.

TABLE V

Imports of sugar at principal Irish ports in cwts

1864 – 1868	98,073	1889 – 1893	366,362
1869 – 1873	158,322	1894 – 1898	1,020,863
1874 – 1878	188,850	1899 – 1903	1,490,866
1879 – 1883	181,211	1904 – 1908	2,691,665
1884 – 1888	143,268	1909 – 1913	2,800,701

Source: *Trade and navigation annual statistics for Ireland.*

In conclusion, deaths from diabetes mellitus rose during the second half of the nineteenth century, the greatest increase occurring during the closing decades and into the twentieth century. Parallel with this rise were significant dietary changes. Total carbohydrate intakes fell, while sugar and fat consumption increased. Which, if any, of these factors was the cause of the increased incidence of diabetes mellitus remains a major epidemiological question, and will require prospective as well as retrospective historical study.

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